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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/074,624	02/13/2002	Yoshikazu Nakayama	57A 3216	7347

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EXAMINER

DEJESUS, LYDIA M

ART UNIT	PAPER NUMBER
2859	

DATE MAILED: 03/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/074,624

Applicant(s)

NAKAYAMA ET AL.

Examiner

Lydia M. De Jesús

Art Unit

2859

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Revision (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Objections

2. Claims 3 and 4 are objected to because of the following informalities:

The complete text corresponding to an acronym, in this case the acronym AFM recited in the limitations of claim 3 and claim 4, should be provided the first instance of using said acronym in the claims.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 2, 5(2)¹, and claim 8(5(2))² are rejected under 35 U.S.C. 102(b) as being anticipated by Wickramasinghe et al. [U.S. Patent 4,474,698, hereinafter Wickramasinghe].

Wickramasinghe discloses a heat emitting probe comprising a conductive nanotube probe needle [26] (see lines 11-20 of column 7 and lines 12-24 of column 9) with a base end portion

¹ The expression 5(2) corresponds to claim 5 as dependent upon claim 2. Similarly, throughout the text of the Office action, the expressions 5(3) and 5(4) will correspond to claim 5 as dependent upon claim 3 and claim 5 as dependent upon claim 4, respectively. Said expression has been provided to simplify the language of the Office action.

² Claims which are dependent upon multiple dependent claim 5 have been addressed using an expression similar to 5(2), described above, for identifying the parent and intervening claims. For example, the expression claim 8(5(2)) corresponds to claim 8, as dependent upon claim 5 as dependent upon claim 2.

Art Unit: 2859

thereof fastened to a holder [24] and a tip end portion [44] thereof protruding; a heat emitting body [thermocouple junction 52] provided on a circumferential surface of said conductive nanotube needle, as shown in Figure 2, a conductive nanotube lead wire, also shown in Figure 2, fastened to said heat emitting body [52], and means [54] for causing electric current to pass through both ends of said conductive nanotube lead wire and said conductive nanotube probe needle, wherein an electric current is caused to pass through said heat emitting body (see abstract and lines 40-59 of column 7). Another conductive nanotube lead wire is connected between the conductive nanotube probe needle and said means for causing current to pass through said conductive nanotube probe needle.

Said heat emitting probe further comprises a scanning mechanism [27] that allows a tip end [44] of said conductive nanotube probe needle of said heat emitting probe to scan over a sample, and a control circuit which passes an electric current through said tip end of said conductive nanotube probe needle, wherein said tip end of said conductive nanotube probe needle scans a surface of a sample [22] while being heated by said heat emitting probe, thus detecting temperature distributions of said surface of said sample as variations in resistance of said heat emitting body.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2859

6. Claims 3, 4, 5(3), 5(4), and 8(5(3), 5(4)) are rejected under 35 U.S.C. 103(a) as being unpatentable over Wickramasinghe in view of Suzuki et al. [U.S. Patent 5,929,438 hereinafter Suzuki et al.].

Wickramasinghe discloses a heat-emitting probe as claimed, as stated above in paragraph 4, but fails to disclose an AFM (atomic force microscope) cantilever in which a protruding portion is used as said holder, two electrode films provided on said cantilever portion, one end of said cantilever wire being connected to one of said electrode films and said conductive nanotube probe needle being connected to another of said electrode films by means of another nanotube lead wire, and wherein said electric current is caused to pass between said electrode films.

However, Suzuki teaches that it is very well known in the art to combine a scanning thermal profiler with an AFM probe in order to observe a temperature profile of a sample in combination with the topography of the sample. In Figure 9 Suzuki shows an AFM probe comprising a cantilever having two electrode films [5] connected to a thermal electromotive force detecting unit [201] (see description of reference numeral [15], considered to be analogous to [201], on lines 41-57 of column 11), a holder portion in which two metal films [204,205] are superimposed to form a thermocouple and are connected to the electrode films.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the scanning thermal profiler disclosed by Wickramasinghe with an AFM probe by providing as the holder for the conductive nanotube probe needle of Wickramasinghe an AFM probe cantilever provided with two electrode films wherein the first and second nanotube lead wires are connected to the corresponding electrode films on the cantilever and said electrode films are further connected to the means for causing current to pass

Art Unit: 2859

through the nanotube probe needle, as suggested by Suzuki, in order to provide corresponding data of the topography of the sample to the temperature distribution profile (see lines 25-49 of column 2).

It is considered that the combination of Wickramasinghe and Suzuki will result in a heat-emitting probe as recited in claims 5(3), 5(4), 8(5(3)) and 8(5(4)).

7. Claim 6(5(2)) is rejected under 35 U.S.C. 103(a) as being unpatentable over Wickramasinghe.

Wickramasinghe discloses a heat emitting probe as claimed, as stated above in paragraph 4, but fails to disclose said sample being a thermal recording medium and said tip end of said conductive nanotube probe needle being heated by said heat emitting probe wherein the information is recorded by means of a hole pattern formed in a surface of said thermal recording medium.

It should be noted that the limitations in claim 6 are directed to the intended use of the claimed heat-emitting probe and it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex parte Masham, 2 USPQ2d 1647 (1987).

However, Hamann teaches the use of heat emitting probe [116] in a magnetic thermal recording and reproducing assembly. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select a heat-emitting probe as that of the combination of Wickramasinghe for performing magnetic thermal recording and reproduction, as suggested by Hamann, in addition to other known functions of thermal profiling to further increase the marketability of the claimed probe.

Art Unit: 2859

8. Claims 6(5(3)) and 6(5(4)) are rejected under 35 U.S.C. 103(a) as being unpatentable over Wickramasinghe in view of Suzuki as applied to claims 3, 4, 5(3), 5(4), 8(5(3)) and 8(5(4)) above, and further in view of Hamann et al. [U.S. Patent 6,233,206 B1, hereinafter Hamann].

Wickramasinghe and Suzuki together disclose a heat-emitting probe as claimed, as stated above in paragraph 6, but fail to disclose said sample being a thermal recording medium and said tip end of said conductive nanotube probe needle being heated by said heat emitting probe wherein the information is recorded by means of a hole pattern formed in a surface of said thermal recording medium.

As discussed above, the limitations in claim 6 are directed to the intended use of the claimed heat-emitting probe and it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex parte Masham, 2 USPQ2d 1647 (1987).

However, Hamann teaches the use of an AFM probe, having a heat emitting structure/heat source, in a magnetic thermal recording and reproducing assembly. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select a heat-emitting probe as that of the combination of Wickramasinghe and Suzuki for performing magnetic thermal recording and reproduction, as suggested by Hamann, in addition to other known functions of thermal profiling and topography scanning to further increase the marketability of the claimed probe.

.Art Unit: 2859

9. Claim 7(5(2)) is rejected under 35 U.S.C. 103(a) as being unpatentable over Wickramasinghe in view of Fischer.

Wickramasinghe discloses a heat-emitting probe as claimed, as stated above in paragraph 4, but fails to disclose detecting thermal conductivity distribution of the sample surface by means of variations in an amount of radiant heat from said emitting body or variations in resistance of said heat emitting body.

Fischer shows the use of a thermoelectric microprobe, similar to the device disclosed by Wickramasinghe, having a needle structure [62] provided on the side of the probe body facing the sample, for measuring the thermal conductivity of a sample surface (see lines 18-44 of column 11).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to perform thermal conductivity profiling of a sample surface with the scanning thermal profiler disclosed by Wickramasinghe, as taught by Fischer, in order to in order to combine the thermal profile with data of additional thermophysical properties.

10. Claims 7(5(3)) and 7(5(4)) are rejected under 35 U.S.C. 103(a) as being unpatentable over Wickramasinghe in view of Suzuki as applied to claims 3, 4, 5(3), 5(4), 8(5(3)) and 8(5(4)) above, and further in view of Fischer.

Wickramasinghe and Suzuki together disclose a heat-emitting probe as claimed, as stated above in paragraph 6, but fail to disclose detecting thermal conductivity distribution of the sample surface by means of variations in an amount of radiant heat from said emitting body or variations in resistance of said heat emitting body.

Art Unit: 2859

Fischer shows the use of a thermoelectric microprobe, similar to the device disclosed by Wickramasinghe for measuring the thermal conductivity of a sample surface (see lines 18-44 of column 11).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to perform thermal conductivity profiling of a sample surface with the probe of the combination of Wickramasinghe and Suzuki, as taught by Fischer, in order to combine the thermal profile and topography data with data of additional thermophysical properties.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Toda discloses an atomic probe type microscope apparatus. Elings et al. discloses a method to increase the speed of a scanning probe microscope. Beha et al. discloses a method of investigating surfaces at nanometers and picosecond resolution and laser-sampled scanning tunneling microscope for performing said method. Balderschwiler et al. discloses a method of preparing probes for sensing and manipulating microscopic environments and structures. Clyne discloses a semiconductor wirebound machine leadframe thermal map system. Pylkki et al. discloses a semiconductor wirebound machine leadframe thermal map system. Pylkki et al. discloses a thermal sensing scanning probe microscope and method for measurement of thermal parameters of a specimen. Hopson et al. discloses a method of forming a probe for an atomic force microscope.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lydia M. De Jesús whose telephone number is (703) 306-5982. The examiner can normally be reached on 12:30 to 8:00 p.m., Monday through Friday.

Art Unit: 2859

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego F.F. Gutierrez can be reached on (703) 308-3875. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 305-3431 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782.



Diego F.F. Gutierrez
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LDJ
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